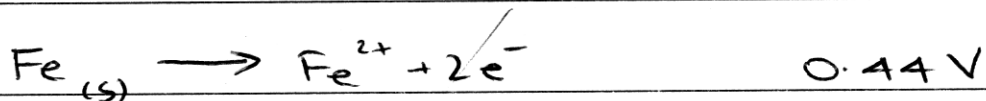


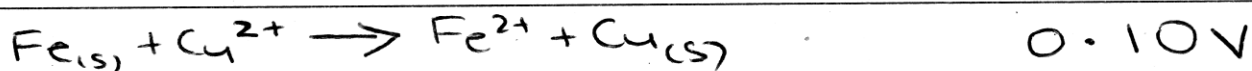
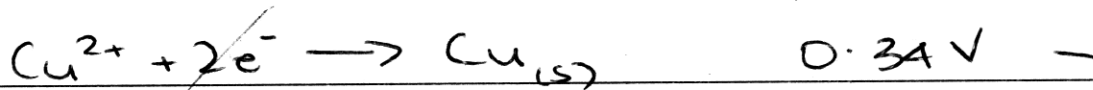
(a)(i) Galvanic cell.

(ii) 

anode reaction



cathode reaction



0.1 V is needed

(b) Galvani, with his 'apparent' discovery of (frog legs twitched when connected in circuit w/ electrodes and power source) 'animal electricity' which was discovered to instead be a galvanic cell, began further experimentation, by other ~~the~~ scientists, of electron movement through a circuit, containing <sup>2</sup> electrodes (oxidising or inert), an electrolyte and a power source.

These other Scientists, Davy and his young lab assistant Michael Faraday, extended on Galvani's findings, as mentioned.

Davy was the first to discover Electrolysis.



He discovered that the frog was ~~acting~~ <sup>'finishing'</sup> the circuit, therefore  $e^-$  were able to circulate.

After Davy's death, Faraday continued research, and was the one to name <sup>the</sup> 'electrolyte'. (The frog in Galvani's experiment was actually an electrolyte - 'finishing' the circuit). Faraday also came up with 2 Laws relating to his findings.

### Faraday's First Law.

The <sup>amount of</sup> product (or decomposed product) produced in ~~a cell~~ <sup>electrolysis</sup> is ~~was~~ directly proportional to the amount of electricity <sup>that is</sup> put through the cell.

~~These~~

Galvani, Davy and Faraday all contributed to the understanding of electrochemical cells and our understanding of electron transfer reactions.

Desalination.

(i) ~~Artifacts are desalinated~~

(ii) ~~Artifacts are~~

The artifacts are gently placed in a deionised water bath for a long period of time to <sup>get</sup> rid of excess salt and other fine particles that are on the surface.

~~Artifacts are~~

~~They are then electrolysed to~~

Curators determine conditions - temp/pressure by which these artifacts will have <sup>a</sup> maximum life-span, and they are put in these conditions.

d) (i) Using electrolysis.

with an acidic electrolyte (<sup>dilute</sup> HCl)  
place the metal electrode at the  
anode, and another metal electrode at  
the cathode.

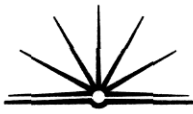
Observe the (rate of) <sup>corrosion</sup> ~~reaction~~ at the  
anode.

Repeat using a neutral electrolyte ( $H_2O$ )

(ii) It <sup>was</sup> ~~is~~ observed that the <sup>electrolytic</sup> cell containing  
the acidic electrolyte had a faster rate  
of corrosion than the neutral ~~etc~~ electrolyte  
cell. This supports the hypothesis that  
acidic environments accelerate the corrosion  
of shipwrecks.

Acidic compounds act as a catalyst in  
these reactions (corrosion). Therefore, the catalyst;  
by decreasing the activation energy, increases  
the reaction rate.

Also the more concentrated the <sup>(electrolyte)</sup> environment is,  
the greater the <sup>corrosion/</sup> reaction rate.  
corrosion rate depends on concentration of  
electrolyte, nature of electrolyte, nature of  
electrodes.



c) Corrosion of metallic objects is affected by temperature, amount of dissolved oxygen and pressure.

The ocean ~~is~~ <sup>has</sup> a mixture of high and low temperatures, high and low pressure and amounts of dissolved oxygen. These changes occur at different ocean depths.

The ocean is RELATIVELY warm, ~~for~~ <sup>until</sup> the depth whereby light is no longer penetrable. Below this ~~At this~~ depth temperatures are extremely low, which decreases rate of corrosion. ~~High~~ <sup>High<sup>er</sup></sup> temps therefore increase rate of corrosion.

Dissolved oxygen is more present at lower depths. The more dissolved oxygen there is the greater the rate of reaction.

High Pressure is found at greater ocean depths. High pressure promotes reactions (oxygen and metal reactions - corrosion) therefore the rate of reaction increases as pressure



increases.

These three factors coincide to create an environment at great depths which enables fast corrosion of metallic objects